



BITS,PILANI-DUBAI CAMPUS,KNOWLEDGE VILLAGE,DUBAI
SECOND SEMESTER 2005-2006

II year - ME UC211 APPLIED THERMODYNAMICS QUIZ 2 DATE: 19-04-06

DURATION: 30 MINUTES MAXIMUM MARKS: 10 WEIGHTAGE: 10%

Name of the student: Id.:

Fill up the blanks.(10 * 1 = 10 marks)

1. If the air is unsaturated, the water vapor present in the atmospheric air exists in -----
----- state.
2. Adiabatic saturation temperature is always considered to be equal to -----
temperature.
3. In the adiabatic evaporative cooling process ----- remains constant
4. The degree of saturation varies between ----- and -----.
5. In a cooling tower approach is equal to the difference between ----- and
-----.
6. One ton of refrigeration is equal to ----- kJ/hour
7. Both the superheating of the vapor at the evaporator outlet and the sub cooling of the
refrigerant at condenser outlet contribute to ----- in the refrigerating effect of
the vapor compression cycle.
8. Work input for the vapor absorption system is ----- than the work input for the vapor
compression system of same capacity.
9. COP of the gas cycle refrigeration system in terms of pressure ratio (r_p) and the adiabatic
index is -----
10. Name any two types of vapor absorption systems.
a. ----- b. -----

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SECOND SEMESTER 2005-2006

II Year

ME UC211 APPLIED THERMODYNAMICS Comprehensive Exam DATE: 1-06-06

DURATION: 3hrs MAXIMUM MARKS: 40 WEIGHTAGE: 40%

Notes: Thermodynamic tables are allowed.

Highlight all your answers by enclosing in boxes. Assume any missing data suitably and mention the same at the appropriate place in your answer. All the parts of the same question should be answered together.

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1.
 - a. Explain the working of the diesel cycle with P-V and T-S diagrams and derive an expression for the air standard efficiency of the cycle in terms of compression ratio and cutoff ratio. 4
 - b. Explain the working of a four-stroke diesel engine with simple sketches. 3

 2. A six cylinder gasoline engine operates on the four stroke cycle. The bore of each cylinder is 80mm and the stroke is 100mm. The clearance volume per cylinder is 70cc. At a speed of 4000 rpm the fuel consumption is 20kg/hour and the torque developed is 150N-m. Calculate
 - a. the brake mean effective pressure
 - b. brake thermal efficiency if the calorific value of the fuel is 43000kJ/kg
 - c. the relative efficiency on brake power basis. Assuming the engine works on the constant volume cycle. Take $\gamma = 1.4$ for air. 7

 3. Steam at 50 bar and 500°C enters the turbine of a simple Rankine cycle and the condenser pressure is 1 bar. Find cycle efficiency. If pump and the turbine each have 80% isentropic efficiency find the cycle efficiency. 6

 4. Explain the working of vapor compression refrigeration cycle with PH and TS diagrams and derive an expression for the COP of the cycle. 6

 5.
 - a. Derive an expression for finding minimum power required for a multistage reciprocating compressor with N stages with perfect intercooling. 4
 - b. Air at 40°C DBT and 27°C WBT is to be cooled and dehumidified by passing it over a refrigerant filled coil to give a final condition of 15°C DBT and 90% RH. Find the amount of heat and moisture removed per kg of dry air. 3

 6. A simple gas turbine plant operating on the Brayton cycle has air inlet temperature of 27°C, pressure ratio of 9 and maximum cycle temperature of 727°C. What will be the improvement in cycle efficiency and output if turbine process is divided in to two stages each of pressure ratio 3 with intermediate reheating to 727°C. 7

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SECOND SEMESTER 2005-2006**

II Year- ME UC211 APPLIED THERMODYNAMICS TEST II DATE: 14-05-06

DURATION: 50 MINUTES MAXIMUM MARKS: 20 WEIGHTAGE: 20%

Use of thermodynamic tables is allowed

(Class notes and prescribed text book are allowed)

1. An air-water vapor mixture enters an adiabatic saturator at 40°C and leaves at 30°C which is adiabatic saturation temperature. The pressure remains constant at 100kPa. Determine the relative humidity, the dew point temperature and the humidity ratio of the inlet mixture. 5

2. A simple R-12 refrigeration system is to develop 5 tones of refrigeration. The condenser and evaporator pressures are 1000 kPa and 200 kPa respectively. Determine a) the refrigerant mass flow rate b) volume flow rate handled by the compressor c) the pressure ratio d) the heat rejected to the condenser in kW. e) the COP and f) the power required to drive the compressor. (For R-12 take h_f at 1000kPa = 76.27 kJ/kg). 6

3. Differentiate between open cycle and closed cycle gas turbine plants with simple sketches. What do you mean by regeneration in gas turbine plants? 3

4. In an closed cycle constant pressure gas turbine air enters the compressor at 1 bar and 300 K. The pressure of air after the compression is 6 bar. The isentropic efficiencies of the compressor and the turbine are 80% and 85%. The maximum temperature of the cycle is 1000 K. Taking the mass flow of air as 2kg/sec calculate the power output and the thermal efficiency of the gas turbine plant. 6

**BITS, PILANI-DUBAI CAMPUS, KNOWLEDGE VILLAGE, DUBAI
SECOND SEMESTER 2005-2006**

ME UC211 APPLIED THERMODYNAMICS QUIZ1 DATE: 08-03-06

DURATION: 30 MINUTES MAXIMUM MARKS: 10 WEIGHTAGE: 10%

Rewrite the answer in the blanks provided. Change of answer is not permitted.

Name of the student: -----

Id.: -----

1. Which of the following statement is wrong?

- a) 4 stroke engine develops twice the power as that of 2 stroke engine
- b) For the same power developed a 4 stroke engine is lighter, less bulky and occupies less floor area compared to two stroke engines.
- c) The petrol engines are costly than diesel engines
- d) all of the above

Answer:-----

2. A petrol engine has compression ratio in the range of

- a) 6 to 10 b) 10 to 15
- c) 15 to 25 d) 25 to 40

Answer:-----

3. Which of the following statement is correct regarding diesel engines?

- a) a fine fuel spray mixed with air which is at a high pressure is ignited by the heat of compression
- b) the fuel supplied to engine cylinder is mixed with necessary amount of air and the mixture is ignited with the help of a sparkplug
- c) the fuel is first evaporated after passing through a carburetor and is mixed with air before ignition
- d) none of the above.

Answer:-----

4. If brakepower =25 kW and mechanical efficiency =80% then determine the frictional power

- a)6.75 kW b)6.5 kW c)6 kW d)6.25 kW

Answer:-----

5. In SI four stroke cycle engine the camshaft runs at..... the speed of crankshaft

- a) twice b) same c) half d) any speed irrespective of

Answer:-----

6. For the same compression ratio and heat rejection
- a) Otto cycle is less efficient than diesel and dual cycles
 - b) Diesel cycle is more efficient than Otto and Dual cycles
 - c) Dual cycle is more efficient than diesel cycle but less efficient than Otto cycle
 - d) Dual cycle is more efficient than Diesel and Otto cycles

Answer:-----

7. Operating between the same temperature limits
- a) Carnot cycle is more efficient than the regenerative Stirling & Ericson cycles
 - b) Stirling cycle is more efficient than Ericson and Carnot cycles
 - c) The regenerative Stirling & Ericson cycles and Carnot cycle are equally efficient
 - d) Cannot say as efficiency is also dependant on other parameters

Answer:-----

8. Which of the following statement is correct regarding diesel engines?
- a) Delay period is the time gap between the introduction of fuel and attainment of peak pressure
 - b) Knocking decreases as the delay period increases
 - c) If Octane number for the fuel is more, the knocking will be less
 - d) If Cetane number for the fuel is more, the knocking will be less

Answer:-----

9. The ratio of the indicated thermal efficiency to the air standard efficiency is known as
- a) mechanical efficiency
 - b) overall efficiency
 - c) volumetric efficiency
 - d) relative efficiency.

Answer:-----

10. Which of the following statement is correct regarding petrol engines?
- a) If inlet temperature increases knocking decreases
 - b) Retarding the spark timing will decrease the knocking
 - c) If cooling water temperature is more knocking will be less
 - d) Supercharging will decrease the knocking

Answer:-----

**BITS, PILANI-DUBAI CAMPUS, KNOWLEDGE VILLAGE, DUBAI
SECOND SEMESTER 2005-2006**

ME UC211 APPLIED THERMODYNAMICS TEST 1 DATE: 26-03-06

DURATION: 50 MINUTES MAXIMUM MARKS: 20 WEIGHTAGE: 20%

Use of thermodynamic tables is allowed

1. Draw the actual and theoretical P-V diagrams of a two stroke SI engine and explain the salient points and state why the two diagrams differ each other. 3

2. A six-cylinder four-stroke gasoline engine having a bore of 90mm and a stroke of 100mm has a compression ratio of 7. The relative efficiency based on the indicated power is 55%. When the ISFC is 300gm/kW-h estimate the calorific value of the fuel and the Total Fuel Consumption given the indicated mean effective pressure is 8.5 bar and the speed of the engine is 2500 rpm. 7

3. Explain the various methods by which the efficiency of the simple Rankine cycle can be improved by drawing the relevant TS diagrams. 3

4. Steam at 20 bar and 500°C enters the turbine of a simple Rankine cycle and the condenser pressure is 0.75 bar. Assuming a mass flow rate of 0.1 kg/sec find the cycle efficiency and the power developed. 7